

HOLISTIC APPROACH FOR IMPROVING THE FTTH BUSINESS CASE

Koen Casier, Sofie Verbrugge, Bart Lannoo, Jan Van Ooteghem, Piet Demeester

*Dept. of Information Technology (INTEC), Ghent University/IBBT, Gaston Crommenberglaan 8, 9050 Gent, Belgium
{Koen.casier, Sofie.Verbrugge, Bart.Lannoo, Jan.Van.Ooteghem, Piet.Demeester}@intec.ugent.be*

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Abstract: For most European operators, there is more value in upgrading their existing infrastructure than installing a new FTTH network. One approach to improve the FTTH business case could consist of using a holistic approach, where different aspects are optimized together.

First the operator needs to know which areas in a region to rollout first, to postpone or skip. The operator will select the best set of customers to connect in order to maximize its business case. Next, the operator should look for approaches to reduce the costs of an FTTH rollout. The cost for installing the fibres in the network is dominating and the largest reduction here can be achieved by finding synergies with other infrastructure owners. Finally the operational expenditures are also an obstacle for many operators. They have a good understanding of operations for their current infrastructure, while a new fibre based infrastructure will clearly bring uncertainty here.

In this paper, we show how tackling the business case on those three fronts – strategic geo-marketing, synergetic installation and detailed operational modelling – greatly improves the viability of the business case of FTTH. It could also lead to an earlier FTTH deployment and higher coverage.

1 IMPROVING THE FTTH BUSINESS CASE

In many European countries, there is already a good existing copper or coaxial telecom access network in place [1]. Replacing this network by a fibre network up to the customers' homes, involves tremendous infrastructure works. For most European operators, there is more value in recycling and upgrading their existing infrastructure, regardless of the higher equipment and operational expenditures, in order not to incur the large trenching overhead. Still, as soon as one operator deploys FTTH, all other operators will most probably follow and aggressively rollout FTTH in the same regions in order not to lose a foothold there [2]. Each operator must be prepared for such situation and have a solid future proof strategy for the rollout. To improve the business case of a FTTH rollout, we believe that there is a need for a holistic approach where different aspects are optimized in a common way instead of considering them separately.

The operator needs to know which areas in a region to rollout first and which areas to postpone or skip. The customer is of vital importance in the

outcome of the business case, and the operator will have to select the best set of customers to connect in order to maximize its business case. Working at this level requires a huge amount of information and calculation, and this quickly becomes prohibitive. Building such a geo-marketing strategy requires intelligent clustering approaches aimed at reducing the complexity while not discarding too much detail. This process should be split in three consecutive steps: (1) aggregating all input information and extracting a logical classification of the customers in logically separated types, (2) clustering groups of customers according to their profile and the trenching distance required and (3) extract the best rollout strategy based on those groupings.

The cost for installing the fibres in the network, also referred to as the outside plant, will be dominating (e.g. in a fully buried installation this can amount up to 70% of the overall costs). The business case can be substantially improved by lowering this installation cost. The largest reduction in cost can be achieved by finding synergies with other infrastructure owners for the installation of the network. When the installation in the trench can be completely split between two operators, the cost for each operator will drop to almost half. Three

important questions arise in this context: (1) how can the different operators be encouraged to cooperate for installations, (2) how can the installations of different infrastructure owners be optimally synchronized and managed, and (3) how should the costs be split amongst the different operators in order to fairly reflect the joint and dedicated installation part of each infrastructure.

Finally, next to the trenching cost also the operational expenditures (OpEx) will be an important obstacle for the operator. The current copper or coaxial infrastructure has been in use for several decades. The operator has a good understanding of the operational processes, expenditures and optimizations in its network. With the advent of a new fibre based infrastructure, this brings additional risks into the corporation. Clearly considering the distributed character of the outside plant, this cannot be neglected. Even more, when different infrastructures are combined in trenching, ducting, or even up to installation, the new operational processes are hardly known.

Tackling the business case on those three fronts – strategic geo-marketing, synergetic installation and detailed operational modelling – simultaneously would greatly benefit the viability of the business case of FTTH and could lead to an earlier FTTH deployment with a higher coverage. In the following sections, the opportunities on each of the three considered fronts are discussed in more detail.

2 FOCUS ON THE BEST CUSTOMERS

Any business case will start from the customers. Who are they and what are they willing to pay for the products or services? An overall view on the customer base could be sufficient for a low risk deployment. For a project involving huge upfront investments, such as an FTTH deployment, the profile of the customers should contain as much detail as one can get. The vast amount of information on each potential customer will be too much to understand and work with. The operator will typically try to identify profiles of customers, e.g. young-telecom-minded, early-adopter, IT-professional, video-enthusiast, etc. For each of those profiles, the operator can build a detailed marketing strategy, adoption model, etc. and unify them in a dedicated business model. However, as FTTH is a fixed architecture, it involves large infrastructure works for providing all customers with a fibre connection to the central office. This part of the access network contains all fibres, cables, and ducts,

is called the outside plant. The structure of the outside plant renders it infeasible to connect on a per customer basis. The large costs for connecting the customers will call for a further clustering exercise in which the best groups of customers are selected according to their profile (average for the group) and the expected installation costs.

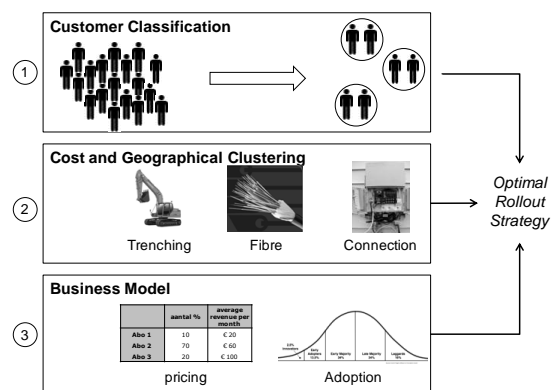


Figure 1: The three geomarketing steps to come to an optimal rollout

Figure 1 shows the three steps in constructing the best cherry picking strategy for the operator: (1) gathering all information and classifying all inhabitants according to their profile, (2) grouping customers in selected areas according to their profile and expected trenching length and (3) making up the full business model given the customer groups and priorities.

As a basis for the cherry-picking, the operator has to find all information available for each potential FTTH customer (both inhabitants and companies). Considering an FTTH deployment the following five classes of information will be very important:

User related information

1. Demographic information: type of inhabitants, family situation, type of dwelling, education etc.
2. Economic information: average income of the inhabitants, type of business, turnover of the companies in the area, etc.
3. Marketing information: existing customers, customer base for any competitor, average revenue per user (ARPU), value adding services over the infrastructure, etc.

Infrastructure related information

4. Geographic information: is there infrastructure available to be reused, will the cabling be deployed on the sidewalks or at the edge of the street, the type of soil and existence of barriers for crossing (e.g. major roads, rivers, etc.

5. Other sources: own infrastructure such as buildings, street cabinets, existing ducts, etc.

This information must be aggregated within one database and all missing information must be clearly indicated. An operator will typically have to contact a third party for retrieving this information from the different sources and even from its own data-warehouse. The existence of such a data-integrator and the amount of detail in which it can offer data will be one main determining factor for the pace at which the operator advances in planning the FTTH deployment strategy. The information in this database will without doubt contain too much detail to work with. Especially for reducing the complexity of the calculations, it will pay off to aggregate the existing data. As the outcome of the business case is most dependent on the customer revenues and the overall costs, these will also be the main directions to look for in step 1 and 2 in Figure 1.

In the first step the customers are grouped according to a limited set of profiles. To this goal, different techniques from data-mining are used. It is for instance useful to use statistical methods for finding highly correlated values, leading to a limited set of customer types (profiles).

In the second step, the essential and specific background of the FTTH business case is brought into the geomarketing calculations in order to really grasp all possible cost reductions. This is typically tackled using some kind of geographical clustering approach. Clearly customers will be grouped according to geographical distance and their assumed ARPU as found in their profile. As such we will most probably find different smaller closed areas in the region in which all customers have (or lack) more or less the same drive towards FTTH.

Finally, at the end of the first two steps, the operator ends up with a data-set containing for each customer its geographical group and customer profile it belongs to. This information will form the basis for calculating the cost for the deployment of FTTH in each part of the region. By deploying each group at the right time taking into account the full business case will provide the optimal rollout strategy for the considered region

In [3] we investigated the potential of geomarketing for improving the FTTH business case. We found a huge improvement for a geomarketing FTTH business case, in comparison to the original business case which was developed in [4]. The results indicate that geomarketing could

increase the final outcome of the FTTH rollout with more than 20%. Additionally it shortens the payback period by two years and reduces the initial investments up to 20%.

It is important to note here that the tools and the manner, in which the integration from information, through customer profiling up to deployment strategy is handled, will be of high importance. With a flexible and extensible implementation in place, the operator can perform the study again at a later stage without much effort, reflecting changes in customer information, equipment pricing, installation costs, etc. Iterating over this approach with more detailed calculation approaches, both in clustering as in estimating the installation length and cost, allows for reaching a highly reliable strategy for the rollout of an FTTH network. Additional opportunities for savings in trenching of the outside plant are discussed in detail in the following section.

3 DEPLOY IN SYNERGY

As mentioned, the costs for rolling out FTTH will be dominated by the costs for installing the outside plant. Especially in the European context, where trenching is often required by law, the digging works are prohibitive for all but the very high density cities. Any possibility for reducing this cost can greatly improve the business case for the operator. Technological advances will lower the costs for the equipment to install in the network and will without doubt deliver new and enhanced installation techniques such as micro-trenching. Much more savings are possible by looking for synergies when installing the infrastructure, as shown Figure 2. A joint installation or network sharing between different operators will allow all operators to reach the customers at a joint cost of only a single (albeit possibly slightly more costly) installation. By sharing this cost, the dedicated cost per operator might decrease significantly. Joining forces with other infrastructure providers, e.g. gas or electricity (see also Figure 2), leads to comparable savings. It's worth noting that the synergy can stretch up to the customer connection, in which the customer is connected to all infrastructures in only one intervention. This could again save a lot, but might require additional administration, aligned operational processes and more trained technicians.

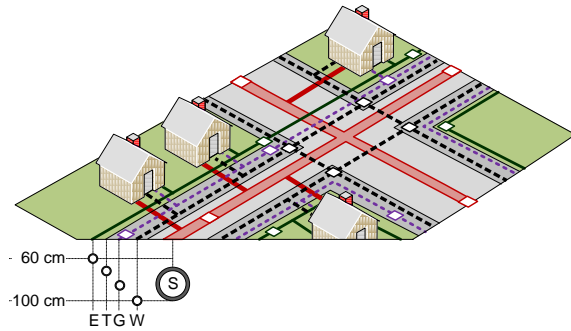


Figure 2: The short proximity of underground infrastructures (Electricity (E), Telecom (T), Gas (G), Water (W) and Sewage (S)) allows important cost savings through synergies.

Not only for operators but also for public authorities, it pays to facilitate the cooperation between the different infrastructure owners, as this will reduce the final costs charged to the customers as well as reduce the amount of road works in the area. Clearly many different parties will be involved and can gain by joining the installation partly or completely in a given region. It is essential to draw a complete value network involving all of them in order to take the right decisions. A so called multi-actor analysis will clearly show where the different actors are performing comparative roles over the different infrastructures, and where the main differences are found. The analysis helps in identifying the instances in which a joint installation of FTTH with other parties might be possible and provide cost savings for all parties. Here lies an opportunity for public actors to improve the cooperation and interaction between the different players.

Once all actors have been identified, it will also become clear at which level the cooperation can take place. Figure 3 gives an overview of the different levels at which two or more infrastructure owners can jointly deploy their network.

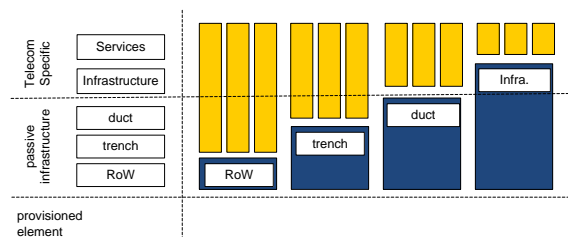


Figure 3: There are cooperation and unbundling opportunities at different levels.

Cooperation at the right of way level is a fairly straightforward step in which the public authorities can be a moderator or an actual party involved. Lowering the requirements for acquiring the right of way for joint deployments for instance can force the infrastructure owners to cooperate. At this level also a broad platform of actors can open up a broader right of way for instance next to railway infrastructure or highways, in existing ducts or on the facades/poles.

Cooperation with joint trenching will most probably lead to the highest cost reduction per party. To put things simple, installation of two infrastructures in the same trench will reduce the dedicated trenching cost to half. This is of course an overly simplified example as a joint installation will lead to additional management and administration. Additionally, the planning process should also take this into account as different infrastructures will have diverse requirements on installation (e.g. maximum number of customers on a line, legally enforced minimal safety installation depth and distances between infrastructures, maximum length between customer and central office, number of control points per km, etc.). In [6] we performed an initial quantification on the costs of a joint installation at this level. The results of this study showed that more than 20% and up to 55% installation cost savings were possible for a joint installation in a dense urban situation and 10% up to 45% in a more rural area. Most savings were possible in case all infrastructure owners – gas, water, electricity and telecom – would join the installation. In case this is not possible, the second best synergy is found between telecom and electricity when considering an FTTH network. This joint trenching is currently only realistic in Greenfield situations or large municipal works. This study only looks at the expenditures in trenching and installation, while cooperation at this level will also have an impact on the operational processes, as it might imply a different topology, control locations, lower distance between cabling, etc. This impact will be discussed in more detail in the following section.

Cooperation at duct level involves the joint installation of a duct topology in which different infrastructure owners can install their dedicated equipment. Synergy at this level resolves some of the difficulties as mentioned in the trenching level cooperation (easier administration, cost allocation, etc.). Still a lot of technical issues need to be resolved for such a far-reaching cooperation. Here especially the vendors of passive equipment and cabling, as used in the outside plant, can take actions to facilitate synergies at this level. Cooperation at the ducting level will without any doubt have a

considerable impact on the operational processes. Currently often only telecom infrastructure is using ducts and those ducts are not reusable for other infrastructure owners.

At a higher level, the cooperation is typically restricted to telecom operators sharing the fibre. Regulatory instances often act at this level and can force the operator to open up the network at a predefined level (fibre, wavelength, bitstream, etc.) for a cost-based determined tariff.

Deploying FTTH in synergy with other operators or infrastructure owners holds the promise of reducing the cost of the outside plant - the dominating cost (up to 70%) - considerably. Still there are several obstructions to be tackled, both of technical, operational and administrative nature. Public authorities can play a very important role here in identifying the actors involved and giving (e.g. legislative) the right incentives to cooperating actors. In addition, it is important for all actors to agree on which level the joint installation should take place and how the costs will be divided amongst all. Synergies will benefit substantially when the trenching or ducting level are shared.

4 OPERATE THE JOINT INFRASTRUCTURE

Installing the outside plant in cooperation with other operators and infrastructure owners will definitely reduce the costs for each actor. On the other hand, such joint installation will undoubtedly lead to important questions considering the operations of the network. In case of an FTTH network deployment, the operator will replace large parts of the access network with a new fibre based network. It has no long-running experience with respect to maintaining and replacing the fibre based access network and equipment. Operational expenditures can sum up to 50% of the total costs; still they are often modelled in little to no detail. Without any doubt this uncertain situation poses additional risks.

In order to accurately model the operational costs, two aspects are essential: the flow of activities in the considered processes needs to be detailed and the required input data has to be estimated. The aim of this modelling is to construct a large overview of all processes taking place in the network, and to make an accurate presentation of the different steps taking place in each of those processes. At the same time, the influence of a joint installation on the operations has to be kept in mind.

Key is understanding that, although FTTH is an entirely new network, a lot of information is readily available from the existing network. Many of the

steps taking place in the processes for an existing network infrastructure will also be required in the corresponding processes in an FTTH network (or in a joint network infrastructure). Although there is a difference between copper welding or coaxial repair and fibre splicing, many other activities in the failure repair process will still be very similar for FTTH, e.g. the time consuming activity for the repair teams of getting to and from the location of the failure. It is advisable to use a modelling language (or graphics) that is intuitive to the different people involved in the process (e.g. technicians, experts). Typically flowchart based approaches are used for this case. They are well standardized, fit intuitively with existing information sources and are easy to understand. Plenty of tools are available for modelling and drawing operational processes.

Figure 4 gives an example for the process model used in [7]. This process model shows the actions to be taken when an underground infrastructure is damaged. We used this model as a starting point and made a quantitative cost comparison between a separate repair process and a joint repair process for all infrastructures - telecom, electricity, gas and water. The results showed that, when infrastructures are not close to each other and consequently do not fail together often, this joint process would increase the operational expenditures for the repair. On the other hand, when the infrastructures are close to each other and have a larger possibility for failing together, the joint process can become more cost-effective. In the situation where the infrastructures always fail together, a cost saving of the repair process up to 40% is possible.

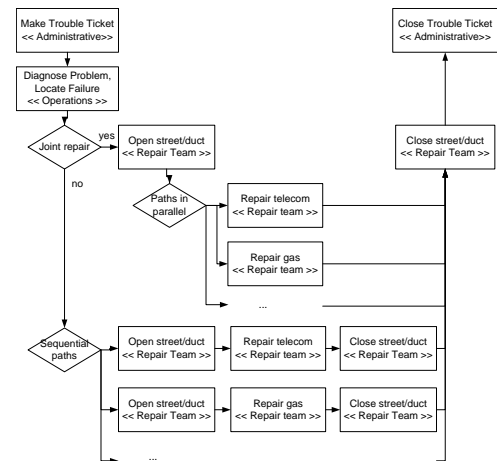


Figure 4: flowchart model for the repair process with an indication of the difference between joint and separate repair actions.

It is essential for an operator to model all operational processes in detail. Once modelled, the costs for executing these processes can be estimated fairly straightforward. Especially considering synergies and the repair of network failures, a lot of questions remain unanswered in the process description. In case of a joint installation, and especially in case of shared ducts, special attention should be given to the flow of control between the different infrastructure owners. Which infrastructure has automated fault detection and at what accuracy, how will every actor involved (also public actors) get informed of the problem, who will perform repair actions first, who will dig up to the cables and how will this cost be allocated to the others using the same well, etc. More detailed modelling of all operational processes will also enable the operator to compare more trustworthy different alternative installation types or operations, to find bottlenecks and scheduling problems. As such he can keep a good eye on the current OpEx and control and optimize future OpEx.

5 A CALL FOR ACTION

Clearly a holistic approach – where different aspects are optimized in a common way instead of considering them separately – can substantially improve the viability of the business case for an FTTH deployment. As a consequence it could help to speed up the rollout of FTTH in Europe and lead to a higher coverage at the same time. It requires actions of the different actors – operators, infrastructure owners and public instances - involved.

The first focus is on the overall business case for which the customers (ARPU, adoption, etc.) play the most important role. Public instances can enhance the view of the operators by facilitating information gathering on (potential) customers. Dedicated data integrators would also be very valuable in filling a gap here. The operator can use this information in combination with techniques from data-mining and geomarketing to find a viable long-term FTTH deployment strategy. Initial research showed a great potential improvement here, with an increase of the outcome up to 20% in comparison to the original business case.

The second focus is on reducing the costs, especially the dominating costs for the installation of the outside plant. Here, synergies with the other infrastructure owners and public authorities can help to significantly reduce the installation costs. The public authorities have an important role here. They

can promote joint installations by facilitating the right of way; they can moderate the synergies between different actors on other levels and can finally also put the right incentives (e.g. legislative) in place to force the different actors to cooperate. Initial research showed a potential cost savings in the range of 10%-50% when different infrastructure owners would perform joint installations of their equipment. The full benefit can be obtained when all infrastructure owners (gas, electricity, tap water and telecom) join installation.

Finally it is crucial to reduce the risks of the new FTTH network infrastructure to a minimum. In this context especially the highly uncertain operational expenditures are very important. Operators need to construct clear models for the operational processes taking place in an FTTH or joint network. They can readily gather a lot of information on this from their existing installation base. Finally also the vendors should provide clear operational requirements for their technical solutions. Initial research showed here that savings are not always possible, but could in some specific cases amount up to 40% of the original expenditures for these operational processes.

Clearly while all three approaches, especially in combination, promise important cost reductions, there is still a lot of research to be tackled on each of them. This does not only require additional theoretical research, but will also require improvements in logistics, administration and management.

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